

Agenda



- Samtec Introduction
 - Who we are
- Testing Standards
 - SET, 55302, EAI
- GAP Analysis
 - What really sets them apart?
- Conclusion/Q&A

Your Presenter

- John Riley, <u>John.Riley@samtec.com</u>, Sr. Technical Marketing Engineer
 - John Riley is senior technical marketing engineer at Samtec. For more than 22 years, he has defined, designed, developed, and tested high-performance copper, RF and optical interconnect for a number of rugged and embedded computing applications.
 Additionally, he and his wife champion STEM education, advanced manufacturing techniques and community outreach via their nonprofit maker space. John holds a bachelor's degree in mechanical engineering from the University of Louisville.

Your Contacts

- Chuck Grantz, <u>chuck.grantz@Samtec.com</u>, Mil/Aero Industry Mgr.
- Evan Baumer , <u>evan.baumer@samtec.com</u>, Mil/Aero Testing Coordinator
- Chris Wade, chris.wade@samtec.com, Rugged/Power Product Mgr.

Additional Information

- Visit <u>www.samtec.com/milaero</u>
- E-mail MILITARY@samtec.com
- Website https://www.samtec.com/standards/



BUSINESS MODEL

SILICON-TO-SILICON

HIGH-SPEED BOARD-TO-BOARD

HIGH-SPEED CABLES

OPTICS

RF

CORE BOARD-TO-BOARD

RUGGED/POWER

FLEXIBLE STACKING

SUDDEN SERVICE









GLOBAL INFRASTRUCTURE

SALES

ENGINEERING

OPERATIONS

QUALITY

DIGITAL BIZ



HIGH-SPEED BOARD-TO-BOARD

OPEN-PIN-FIELD ARRAYS | GROUND PLANE STRIPS | ULTRA-MICRO | BACKPLANE



RUGGED/POWER

RUGGED BOARD-TO-BOARD | BLADE POWER



FLEXIBLE STACKING

LOW PROFILE | PASS-THROUGH | ONE-PIECE SKYSCRAPERS | SHROUDED HEADERS | IDC SYSTEMS



HIGH-SPEED CABLE

FLYOVER* | MID-BOARD & PANEL | BACKPLANE | MICRO COAX & TWINAX



OPTICS

AICRO FLYOVER SYSTEMS™ | EXTENDED TEMP



RF

PRECISION RF I 50 Ω SOLUTIONS 75 Ω SOLUTIONS I ORIGINAL SOLUTIONS



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Based on 2023 Sales















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COMPUTER/ **SEMICONDUCTOR**

DATACOM

MEDICAL

INSTRUMENTATION

AERO/ **DEFENSE** **AUTO/TRANS/ TELEMATICS**

CONSUMER

22% 22% 13% 13% 9% 11% 7%

3%

GAP Analysis Overview

- Little to no GAP when looking at the testing method.
- Frequency is a GAP relative to traditional DQT.
 DQT during design, 55302 each lot
- Test reports and tracking may be a GAP relative to traditional DQT
- Capacity of conducting the test at the manufacturing site is a GAP
 - COTS manufactures are not traditionally Mil-Spec only assembly house
 - May require a secondary test house for up screening



Testing Standards

Traditional DQT

- All Samtec series undergo Design Qualification Testing (DQT). This includes Normal Force, Thermal Aging, Mating/Unmating/Durability, IR/DWV, Current Carrying Capacity (CCC), and Mechanical Shock/Random Vibration/LLCR and Event Detection.

SET

- Severe Environment Testing (SET) is a Samtec initiative to test certain products beyond typical industry standards and specifications, many of which are common requirements for harsh environment applications/industries.

MIL-DTL-55302 Lot Screen Testing (EEE-INST-002)

- Military specification detailing the requirements for miniature, high-density, electrical connectors used in electronic systems. The specification covers various aspects including design, materials, performance, and testing criteria to ensure consistency and interoperability across different manufacturers and applications within the military domain.



Traditional DQT



- Traditional DQT
 - Normal Force
 - Thermal Aging
 - Mating/Unmating/Durability
 - IR/DWV
 - Current Carrying Capacity (CCC)
 - Mechanical Shock/Random Vibration
 - LLCR
 - Event Detection.

- The EIA (Electronic Industries Alliance)
 developed standards for electronic
 connectors to ensure compatibility,
 reliability, and performance across
 various electronic devices and systems.
 Here's a brief overview of some key
 aspects of EIA test standards for
 electronic connectors:
 - Physical Dimensions
 - Electrical Performance
 - Mechanical Durability
 - Environmental Testing
 - Material and Finish
 - Interoperability



SEVERE ENVIRONMENT TESTING (SET)

Samtec interconnects are subject to a wide variety of standard test procedures that push the industry limits to help ensure quality and durability in any application.

Severe Environment Testing includes additional testing for interconnect systems that will be used in extreme or harsh environment applications:

- **VITA 47.1 Module Insertions**
- VITA 47.3 Humidity
- VITA 47.1 Vibration Class VS3

- **Exceeds VITA 47.1 Temperature Cycling Class C4**
- **Exceeds VITA 47.1 Non-Operating Class C4**
- VITA 47.1 Operating Shock Class OS2 VITA 47.1 Electrostatic Discharge Resistance
 - **Exceeds VITA 47.1 Altitude for DWV**



SET products are approved for Class D missions that require high-reliability, quick-turn and cost-effective solutions for LEO satellites, SmallSats, CubeSats and other space exploration applications.



SEVERE ENVIRONMENT TESTING (SET)



2024: EXPANDING THE REACH OF SET

55302

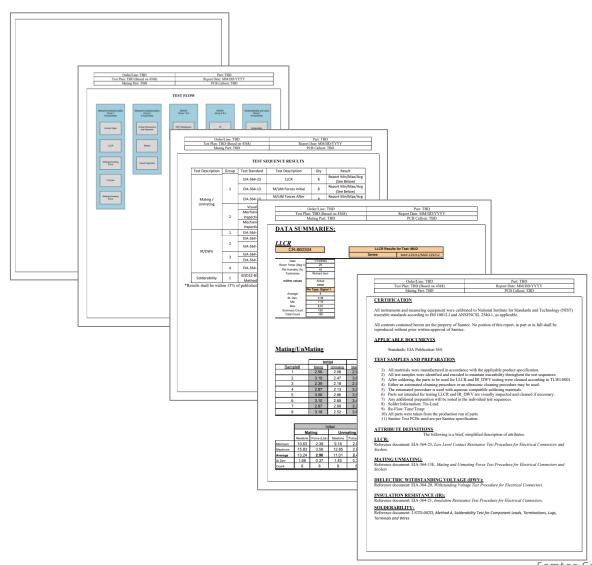
- Salt Spray
- Thermal Shock
- **Enhanced S&V**
- Lot based Inspection





MIL-DTL-55302 LIKE LOT SCREENING TEST

- MIT-DTL-55302 like conformance inspection
 - Modified for Samtec connectors
 - Mate/Unmate/Durability
 - IR/DWV
 - Solderability
 - Group A, Group B, Group C
 - Test reports for shipped with every order



GAP Analysis

MIL-DTL-55302 Conformance Inspection Requirements		Samtec Lot and Qual Conformance			
Group A (Each Lot)		Samtec Lot Sample Screening (Each Lot)			
Requirement	Method		Requirement	Method	Samtec Comment
					Visual and Dimensional inspection per
Visual and Mechanical inspection	Clause 4.5.1		Visual and Mechanical inspection	Samtec Standard	product drawing and visual inspection.
					Microscope is used.
					EIA-364-37 focuses on individual pins that
Contact Engagement and Separation	Claus 4.5.3: EIA-364-37,		Mating/Unmating Forces	EIA-364-13	are crimped and inserted. PCB mounted
Forces	Method A.				connectors would be better represented by
					EIA-364-13. Does Not Apply.
					Samtec publishes mateable products
Interchangeability	Clause 4.5.1.2		N/A	N/A	online. We consider mate/unmate as
					evidence.



GAP Analysis

Group B (Every 24 months)		Samtec Lot Sample Screening (Each Lot)		
Requirement	Method	Requirement	Method	Samtec Comment
Mating and Unmating	Clause 4.5.4: After 3 unmonitored cycles of insertion and withdrawal, the force required to fully insert and withdraw a plug from the receptacle shall be measured.	Mating/Unmating	EIA-364-13	EIA-364-13, Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute
Low Level Circuit	Clause 4.5.12: EIA-364- 23	LLCR	EIA-364-23	No Comment
Contact Resistance	Clause 4.5.5: EIA-364-06	LLCR	EIA-364-23	55302 references AWG to determine test criteria. These are not crimp contact connectors. LLCR is low level, therefore, would be a better test bc it would be more sensitive to changes in resistance. Does Not Apply.
Insulation Resistance	Clause 4.5.8: EIA-364-21	Insulation Resistance	EIA-364-21	Samtec checks pin to pin and row to row.
Dielectric Withstanding Voltage (Sea Level)	Clause 4.5.7.1: EIA-364- 20, Method A	Dielectric Withstanding Voltage	EIA-364-20	No Comment
Crimp Tensile Strength	Clause 4.5.20	N/A	N/A	Applicable to crimp contacts only. Does Not Apply.



GAP Analysis

Group C (Every 36 months)		Samtec Qualification Conformance Inspection (As Requested)		
Subgroup 1				
Requirement	Method	Requirement	Method	Samtec Comment
Visual and Mechanical	Clause 4.5.1	Visual and Mechanical inspection	Samtec Standard	Visual and Dimensional inspection per product drawing and visual inspection. Microscope is used.
Oversized Pin Exclusion	Clause 4.5.2	N/A	N/A	55302 references circular contacts. Samtec pins are stamped with micron level tolernaces. Does Not Apply.
Contact Engagement and Separation Forces	Clause 4.5.3: EIA-364-37, Method A.	Mating/Unmating Forces	EIA-364-13	EIA-364-37 focuses on individual pins that are crimped and inserted. PCB mounted connectors would be better represented by EIA-364-13. Does Not Apply.
Contact Retention	Clause 4.5.6	N/A	N/A	According to MIL-DTL-55302, this does not apply to mounted PCB connectors. Does Not Apply.
Dielectric Withstanding Voltage (High Altitude)	Clause 4.5.7.2: EIA-364- 20, Method A	DWV (Altitude)	EIA-364-20	Samtec to determine the altitude/pressure.
Contact Life	Clause 4.5.9	Extended Life Testing Cycling	Multiple	500 mating cycles with Humidity, Thermal Shock and Mate/Unmate.
Contact Resistance	Clause 4.5.5: EIA-364-06	Current Carry Capacity	EIA-364-70	Above is why Samtec feels Contact Resistance, as detailed in 55302, does not apply. For Qual conformance, Samtec provides current carrying capacity as this, along with LLCR, can indicate contact resistance performance.



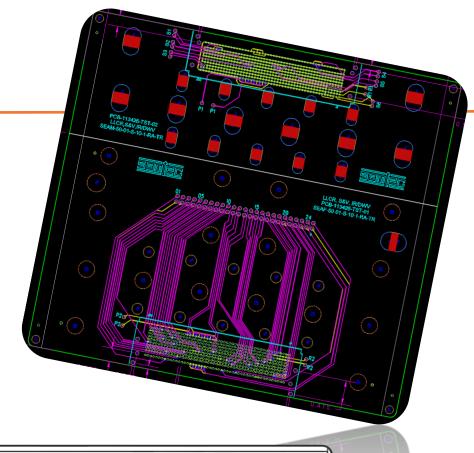
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Observations

- Many test standards work together or reference each other.
- When looking for COTS components review the actual requirements needed.
- Time to market/test completion can be lengthy depending on information that can be shared with the test houses.
- 100% electrical testing may need to evolve.



TEST	EIA-364 Procedure	MIL-STD-1344 Method
Mating and unmating forces	EIA-364-13	MIL-STD-1344 Method 2013
Temperature life with or without electrical load	EIA-364-17	MIL-STD-1344 Method 1005
Withstanding voltage	EIA-364-20	MIL-STD-1344 Method 3001
Insulation resistance	EIA-364-21	MIL-STD-1344 Method 3003
Low level contact resistance	EIA-364-23	MIL-STD-1344 Method 3002
Salt spray	EIA-364-26	MIL-STD-1344 Method 1001
Mechanical shock (specified pulse)	EIA-364-27	MIL-STD-1344 Method 2004
Vibration	EIA-364-28	MIL-STD-1344 Method 2005
Humidity	EIA-364-31	MIL-STD-1344 Method 1002
Thermal shock (temperature cycling)	EIA-364-32	MIL-STD-1344 Method 1003
Contact engagement and separation force	EIA-364-37	MIL-STD-1344 Method 2014



Supporting Information





TIN-LEAD PLATING

Commercial Off-the-Shelf Products are a vital part of the Military / Aerospace and Space industries. Why use Tin-Lead Plating?

 Tin-Lead Plating has advantages over Lead-Free plating including lower processing temperatures, easier field repair, and no issues with Tin whiskers. For these reasons, Samtec still offers many series with Tin-Lead plating options for Military / Aerospace



- Samtec has a large offering of products with LTL (10 μ of Gold in the contact area with Tin-Lead on the tails) and -STL (30 μ" of Gold in the contact area with Tin-Lead on the tails). May require certain pin/row count, stack
- Samtec can also offer non-standard plating options for almost all of our series through Application Specific Products (ASP) Please contact asp@samtec.com for more





OUTGASSING FAQs GUIDE



As Commercial Off the Shelf (COTS) products continue to be used within Military / Aerospace, Space, Industrial, As Commercial Off the Shell (CU15) products continue to be used within Military / Aerospace, Space, incustrial, Transportation, Automotive, and Medical applications, it is important to understand how those products will respond. A lower consequence of the control of the second of Transportation, Automotive, and Medical applications, it is important to understand how those products will respond, A low outgassing component is needed in these environments to prevent damage to sensitive electronics, lenses (optics),

Outgassing is the process in which a non-metallic material such as a polymer, adhesive, rubber, or potting compound Outgassing is the process in which a non-metallic material such as a polymer, adhesive, rubber, or potting compount.

/ epoxy will release a gas when exposed to heat and/or a vacuum. A NASA-developed test standard, ASTM E595... / epoxy will release a gas when exposed to heat and/or a vacuum. A NASA-developed test standard, ASTM E595-77/84/90, is used to determine how much volatile content is contained in material sample; for a product to be qualified for space flight, it must pass this test standard.

Samter utilizes NASA outgassing data to determine if certain products, such as our high-reliability Tiger Eye", high-speed Samter utilizes NASA outgassing data to determine if certain products, such as our high-reliability Tiger Eye⁻, high-speed Q Series[®] and rugged Edge Rate[®] connectors, meet these requirements. NASA uses the ASTM E595-77/84/90 test, and the street in this test include.

- Exposure of the parts to 25 °C at a 50% Relative Humidity for 24 hours
- Exposure in a chamber at 125 °C for 24 hours at a vacuum no less than 5x10-5 torr Products are then weighed . Chamber contains a cooling collector plate at 25 °C to collect gas condensate

The weight of the sample is taken before and after the experiment and the materials are considered to have passed The weight of the sample is taken before and after the experiment and the materials are considered to have pair the total mass lost (TML) and the collected volatile condensible materials (CVCM) are below 1,0% and 0.10% in the condensible materials (CVCM) are below 1,0% in the condensible materials (CVCM) are below 1,0% in the condensibl



Micro Rugged Connectors & Cables • High-Speed Mezzanine • High-Density Arrays • Micro Pitch Connectors • Micro Power

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For more information about military / aerospace offerings please contact military@samtec.com

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Questions



Your Presenter

- John Riley, <u>John.Riley@samtec.com</u>, Sr. Technical Marketing Engineer
 - John Riley is senior technical marketing engineer at Samtec.
 For more than 22 years, he has defined, designed, developed, and tested high-performance copper, RF and optical interconnect for a number of rugged and embedded computing applications. Additionally, he and his wife champion STEM education, advanced manufacturing techniques and community outreach via their non-profit maker space. John holds a bachelor's degree in mechanical engineering from the University of Louisville.

Your Contacts

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Additional Information

- Visit www.samtec.com/milaero
- E-mail MILITARY@samtec.com
- Website https://www.samtec.com/standards/







ABOUT US

Founded in 1976, Samtec is much more than just another connector company, we put people first with a commitment to exceptional service and quality products. We believe that taking care of our customers and our employees is paramount in how we approach our business. This belief is deeply ingrained throughout Samtec and means that you can expect **exceptional service** coupled with **technologies** that take the industry further faster.

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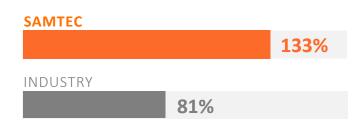
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Samtec is the Electronics Industry's **Service** & **Technology** Leader.

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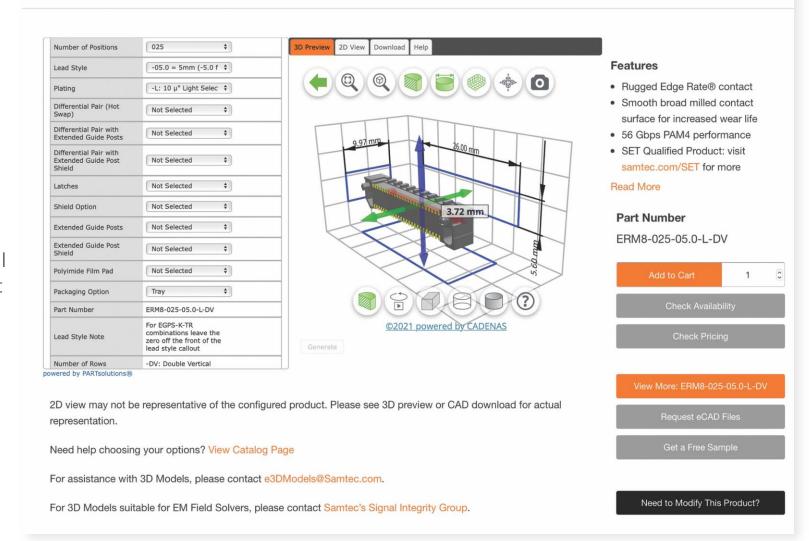


QUICK DOWNLOADS

Samtec 3D Models are accurate to the best of our knowledge and are provided as informational in nature. However due to technical progress, products are subject to change without notice. Please reference the product print for the most current and up-to-date information for this product.



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